A proposed NCAAA-based approach to the self-evaluation of higher education programs for academic accreditation: A comparative study using TOPSIS

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CHRONICLE	ABSTRACT
	Quality standards must be fulfilled to satisfy a base level of quality. Despite using this idea as a foundation, evaluations of academic programs still rely on the evaluators' experiences and may differ from one evaluator to the next. As a result, more precise evaluation approaches must be created to ensure quality is accurately reflected. The main goal of this research paper is to propose and evaluate an approach to assessing higher educational programs using the Self-Evaluation Scale (SES) developed by the Saudi National Commission for Academic Accreditation and Evaluation (NCAAA). The proposed approach is a breakdown of the original performance criteria and standards into sub-criteria and elements to ensure the required data quality. The second goal is to compare the NCAAA's original performance criteria and the proposed evaluation sub-criteria. A comparison framework that uses the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is developed. Data from eight programs offered in a Middle Eastern University was used for the application and comparison between the two evaluation approaches. Results show that both approaches provide different quality performance rankings. The proposed approach demonstrated more conservative and accurate overall quality performance ratings, indicating that application decisions for accreditation are affected.

1. Introduction

The Saudi Arabian Ministry of Education lists 67 universities and colleges in the Kingdom of Saudi Arabia (KSA) (Ministry of Education, 2022b, 2022a). Of the 67 universities, 63 of them are considered higher education institutes (HEIs) in KSA, with 29 governmental institutions (43% of the total) and 38 private institutions (57% of the total). The most recent statistic in 2019 shows that 1.37 million Saudis were enrolled in higher education programs around the country (General Authority for Statistics, 2022). The National Centre for Academic Accreditation and Evaluation (a continuation of the National Commission for Academic Accreditation and Evaluation (NCAAA), is overseen by the Education Training Evaluation Commission (ETEC). The NCAAA acts as a body in charge of academic accreditation and judges the quality assurance (QA) of public and private HEIs (NCAAA, 2018, 2009; Albaqami, 2015). NCAAA grants two types of accreditations. The first is institutional accreditation which reviews the organizational structures of the university as a whole, and the second is programmatic accreditation which conducts an in-depth assessment of the academic programs at a college. For institutional accreditation, 55% of the Saudi Arabian HEIs were granted full accreditation by NCAAA in 2019. While only 11 HEIs (17% of the total) were granted conditional institutional accreditation, indicating that those institutions still need to address certain minor deficiencies in their QA infrastructure. Moreover, 19 of KSA's HEIs (28% of the total) lack institutional accreditation (Education & Training Evaluation Commission, 2022). All already recognized HEIs must uphold NCAAA's

criteria to keep their accreditation, and all unaccredited HEIs must seek full accreditation to ensure quality and be able to compete. For program accreditations, all academic programs offered by HEIs must also meet NCAAA's QA standards and their pertaining criteria. HEIs have regularly used quality control techniques like satisfaction surveys and checklists to gauge stakeholder satisfaction across the board, from QA agencies to parents and students. In addition, in 2019, the NCAAA introduced 17 KPIs for undergraduate and 19 for graduate programs to determine their compliance with the NCAAA QA standards on a yearly basis.

The NCAAA program accreditation includes six QA standards (i.e., mission and goals, program management and quality assurance, teaching and learning, students, teaching staff, and learning resources) that all KSA HEIs academic programs must attain. Therefore, NCAAA requires a "Self-Evaluation Scale for Higher Education programs (SES)" assessment form to evaluate the program on these standards (SES 2020). The document includes 96 quality performance criteria based on the six standards for academic accreditation and QA. The required quality evidence data is usually collected, documented, and analyzed annually by the HEIs to determine compliance rates in yearly assessment cycles. Since the environment in which HEIs function is constantly shifting, they must engage in an ongoing improvement process to successfully navigate operational and financial challenges. Furthermore, the ETEC imposes QA standards to guarantee a minimum quality level of services HEIs must provide. However, the results of a program evaluation depend on the evaluators' experiences and could vary between evaluators of the same academic program. Therefore, more precise evaluation measures should be in place to ensure a true reflection of the program's quality level.

The main goal of this research paper is to propose and evaluate an approach to assessing higher educational programs using the SES form developed by the NCAAA (NCAAA, 2018). The proposed approach in this research paper is to breakdown the original performance criteria and standards (96 quality performance criteria based on six standards) into sub-criteria and elements (146 sub-criteria and 19 elements). The rationale of this breakdown is to ensure the quality of the data required based on the NCAAA scale. The second goal of this research paper is to compare the NCAAA's original performance criteria and the proposed sub-criteria of evaluation and how they can affect the decision regarding the program's accreditation.

2. Literature Review

Recently, the government of the KSA has made many steps to improve the quality of HEIs to enhance the quality of the educational system and the employability of graduates (Alshayea, 2012). Among these measures was the establishment of the NCAAA to ensure the consistent application of quality standards throughout KSA's higher education institutions (Alshayea, 2012; Alsaleh, 2016). All universities and colleges in the KSA, whether public or private, must adhere to the criteria established by the NCAAA (Onsman, 2010; NCAAA, 2009; NCAAA, 2018). Regulations for the NCAAA were initially released in 2009 and updated in 2018 and 2019. In KSA, the NCAAA has not mandated a deadline by which HEIs must adhere to the 2019 requirements and KPIs (NCAAA, 2018). Sooner or later, the 2019 benchmarks will be implemented at every HEI in KSA. However, HEIs that previously acquired institutional clearance for their QA systems before the 2018 rules' publication might employ earlier standards and KPIs. Due to this and the fact that the 2018 requirements are built upon the 2009 standards, the latter will be discussed in the following parts together with the former. Course and program descriptions at HEIs should be written in accordance with the National Qualifications Framework (NQF), as required by the NCAAA quality system. As part of the NCAAA framework, HEIs are expected to implement a plan and review cycle tailored to their specific needs and designed to aid them in reaching their objectives and conforming to the NCAAA 2019 Quality Assurance requirements (NCAAA, 2018). According to the available statistics, most professors are not passionate about the accreditation process and its associated data-collecting obligations, document and form preparation, data aggregation, data analysis, evidence gathering, and the creation of corrective measures (Abou-Zeid & Taha, 2014). As the NCAAA is meant to guarantee that the quality of HEIs in KSA is on par with worldwide norms, the NFQ is a crucial part of the KSA's Quality Assurance Standards (QAS). Institutions must meet at least 22 of the 33 KPIs, whereas programs must meet at least 17 (Abdullah, 2017; NCAAA, 2009). To comply with the 2018 guidelines, institutions must achieve all 23 KPIs. Onsman (2010) discussed some barriers to implementing the NQF in KSA and speculated that the difficulty in keeping up with monitoring academic performance and evaluating educational outcomes while keeping classrooms in a positive state would be a significant obstacle to the implementation of the NCAAA's framework. According to Onsman (2010), keeping an eye on graduate quality throughout the following decade is essential. Planning, implementing, evaluating, and developing education and teaching are all crucial components of QA measures in higher education institutions, as stated by Elhoseny et al. (2016). Time and resources may be saved by better feedback and faster distribution of information needed by decision-makers, according to Almurshidee (2017). Evidence-based performance indicators that meet rigorous external requirements are one type of quality evaluation mechanism advocated by Hamdatu et al. (2013) for HEIs. According to Alkathiri (2020), accreditation in the KSA is not given to HEIs unless they can demonstrate that they have implemented effective QA methods. Multi-Criteria Decision-Making (MCDM) methods were used in the education studies. For example, the Analytic Hierarchy Process (AHP) approach and the Fuzzy Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) were used to analyze data from many different organizations in the higher education sector (Zulqarnain et al., 2020). Fuzzy TOPSIS was used to rate the instructors based on a collection of data, including five criteria and ten instructors. Faculty research output significantly impacts a university's reputation and the quality of its education (Zavadskas

& Kaklauskas, 1996; Hafezalkotob et al., 2019). Therefore, it should be evaluated based on a range of objective and subjective factors, including the number of books written, the amount of funding received as a project leader, the number of scientific publications, and the average number of citations per publication (Krishankumar et al., 2021; Kusnady, 2019; Zulqarnain et al., 2020). When ranking the quality of several lectures, Tuan et al. (2020) used an MCDM strategy that included fuzzy AHP and TOPSIS.

Turan (2018) studied the usage of the AHP and the Stepwise Weight Assessment Ratio Analysis (SWARA), which are examples of multi-criteria decision-making techniques in light of the growing importance of remote education and its numerous benefits. Turan's (2018) study aimed to examine the elements affecting e-learning technologies at one Turkish university's Industrial Engineering department. It was concluded that MCDM might be employed in e-learning contexts to assess many criteria simultaneously. Moreover, using the MCDM methods AHP and TOPSIS, Alqahtani and Rajkhan (2020) proposed a mixed strategy combining onsite and online education to fit the changing demands of students and instructors to be the most preferred alternative for future higher education. By adopting the Simple Additive Weighting (SAW) method, Biswas et al. (2019) examined the efficiency of numerous Indian universities. Some of the factors considered by the authors are the: "percentage of vacant seats during student intake, the strength of the faculty, research publications, sponsored research fund, number of employed students through the placement cell, number of the students who opted for higher studies and the number of PhDs awarded, and number of students who opted for higher studies and the number of sponsored research grants". Kazan et al. (2015) used TOPSIS to analyze students' academic progress using the titles of specific subjects like Turkish, Mathematics, and Science and Technology as criteria for choosing a school. Students' needs at a techno-managerial institution were prioritized in another research by Koltharkar et al. (2020), who used TOPSIS to analyze the significance and performance of eight choice factors. Furthermore, Mohammed et al. (2018) ranked the most effective forms of e-learning using the AHP-TOPSIS method. Webometrics ranking to reliable quantitative data on university websites was proven by Shekhovtsov and Saabun (2020) using the TOPSIS and VIseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR) techniques. Throughout the globe, colleges are becoming more competitive as a result of these efforts. Conflicting opinions often plagued the approach. Researchers and stakeholders in higher education have developed improved methods, such as the VIKOR technique, to provide more accurate webometrics data and rankings for academic institutions' websites (Perdana & Budiman, 2021). Academic prominence and educational quality will both rise as a result of this strategy. Also, the fundamental methodological problems that have sparked heated discussions over rankings will be fixed by VIKOR. The purpose of doing thorough quality assessments and modeling of rankings is to provide reliable website ranking tools and encourage progress toward better teaching and research activities at higher education institutions. In a study examining the assessment and selection of Learning Management Systems (LMS) in higher education's complex environment, Ayouni et al. (2021) used the VIKOR technique. The authors suggest a quality framework for picking solutions from various academic institutions. The results show that institutional policymakers should think about time behavior and clarity. This helps create norms and standards for LMS that improve educational quality.

The Preference Ranking Organization Approach for Enrichment Evaluation (PROMETHEE) method was used as a multi-criteria methodology in the education sector to pick the best teacher competition based on results derived using several criteria defined by the educational authorities (Monalisa & Kusnawi, 2017). To choose the best educator at Islamic Boarding School, Hanifatulqolbi et al. (2019) used a web-based management information system to implement a Multi-objective Optimization based on Ratio Analysis (MOORA) strategy. It will help Islamic Boarding Schools get the best possible teacher for their students quickly and without bias. Bafail and Abdulaal (2022) used a combination of AHP and Ranking Alternatives by Perimeter Similarity (RAPS) as part of their MCDM analysis to rank the Engineering departments at a public institution from 2019 to 2021.

3. The Proposed Methodology

The main objective of this paper is to modify the NCAAA's approach, which is based on 96 quality performance criteria pertaining to six standards divided into five elements for evaluating higher education programs. In the proposed approach, the original performance criteria were broken down into 131 sub-criteria that were predicated on the same six standards but divided into 13 elements. In addition, 146 sub-criteria links to 19 standard elements are used to compare the programs' performance in terms of their quality ratings. The rationale behind the suggested approach is to guarantee the accuracy of the evaluations made using the information acquired from educational programs. As a result, the decision regarding whether to submit an NCAAA accreditation application may change. The second objective of the paper is to study the findings from ranking the educational programs according to their quality performance based on each approach's principles. The proposed approach ranks educational programs using the TOPSIS methodology as opposed to the traditional approach, which employs a decreasing order of the programs' total quality ratings. Since TOPSIS is more reliable and accurate and deals with criteria that have various units and objectives, it is used. The framework for comparing the two approaches in three phases is shown in Fig. 1. The first phase uses a self-evaluation scale document to determine each educational program's quality level. The second phase focuses on ranking educational programs using the NCAAA traditional and proposed approaches. The third phase demonstrates a comparison of the results from the two approaches. These three phases are further details as follows.
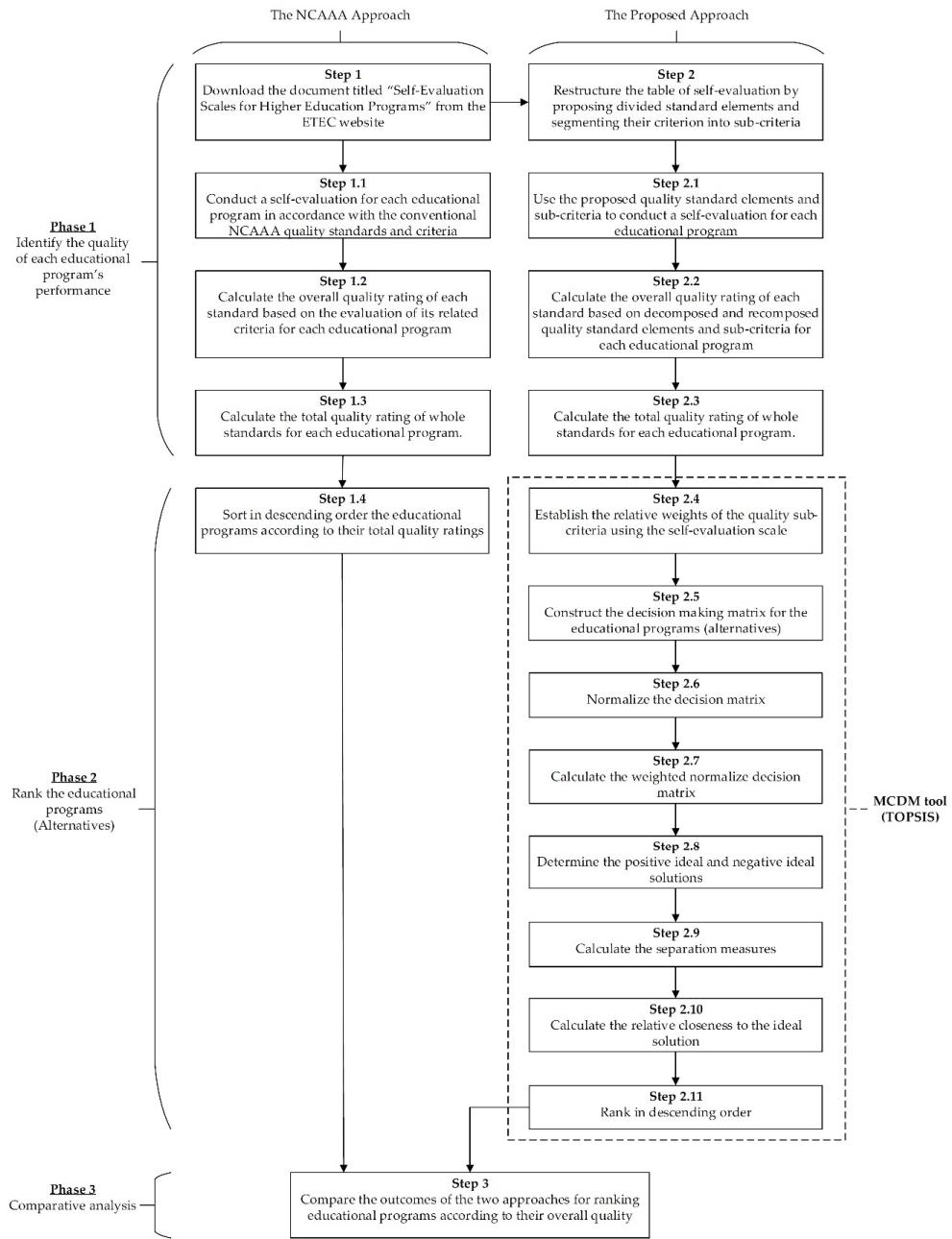
Fig. 1. The framework for comparing the NCAAA approach with the proposed approach

Phase 1: Identify the quality of each educational program's performance (The NCAAA Approach)

Step 1:   The Education and Training Evaluation Commission (ETEC) published a document titled "Self-Evaluation Scales for Higher Education Programs" that was released on its website. This document's goal is to ensure that the educational program's quality criteria are met before the NCAAA is requested for accreditation. Each educational program has to download the document from the ETEC website in this step. It can be seen that the NCAAA has issued six standards in the document, which address the following topics: (1) Mission and Goals, (2) Program Management and Quality Assurance, (3) Teaching and Learning, (4) Students, (5) Teaching Staff, and (6) Learning, Resources, Facilities, and Equipment. In addition, The NCAAA has designed particular elements that the assessment processes rely on for all the criteria specified under each standard element to reach the highest level of accuracy in the evaluation. Some of the criteria were identified as essential criteria by the

NCAAA due to their importance. They have an asterisk (*) next to them and are written in bold font. These standards, standard elements, and the relevant criteria are shown in Table A1 in appendix 1.

Step 1.1: In this step, the educational program that intends to receive accreditation must first perform self-evaluation before applying. The standard is evaluated as a whole (step 1.2) after the criteria have been evaluated to determine the quality of program performance. The program evaluates each criterion on a five-point scale (i.e., 1 to 5) according to the NCAAA's five levels of evaluation, which are as follows:

Level 1 (Non-Compliance) is classified as unsatisfactory performance with a scale value of one, in which criterion components are present but are either not used at all or just applied very minimally.

Level 2 (Partial Compliance) is classified as unsatisfactory performance with a scale value of two, in which the majority of the criteria elements are present but are used inconsistently or with insufficient support.

Level 3 (Compliance) is classified as satisfactory performance with a scale value of three, in which all criteria elements are available, applied at a good level, and regularly; sufficient evidence is available; regular mechanisms for improvement are in place, and positive results are obtained.

Level 4 (Perfect Compliance) is classified as satisfactory performance with a scale value of four, in which all criteria elements are present and used flawlessly. There are numerous and regular approaches for improvement and higher results compared to earlier outcomes.

Level 5 (Distinctive Compliance) is classified as satisfactory performance with a scale value of five, in which all criterion elements are met and are consistently implemented at a distinct level. Excellent evaluation, as well as extensive and cumulative evidence, is available. There is creativity in the practices of the elements of the criterion.

In case the program is not required to apply the criterion because it is not suitable for its nature and activities, the criterion is not counted within the criteria included in the evaluation of the standard.

Step 1.2: In this step, the evaluation will be at the level of the standard as a whole by collecting the points of evaluation for all the related criteria according to their level of quality defined in step 1.1 above. The average is then calculated by dividing the sum of these points by the number of the applicable criteria on the program. In this concept, Eq. (1) will be used to calculate the average quality rating of each standard.

$$A_p^i = \frac{\sum_{j=1}^{n} \sum_{k=1}^{m} V_p^{ijk}}{C_p^i} \qquad \forall\, i = 1, \ldots, S \quad \forall\, p = 1, \ldots, P \tag{1}$$

where,

A_p^i = the average quality rating of the standard i for the educational program p.

V_p^{ijk} = the evaluation score (1 to 5) of criterion k related to standard element j and standard i for the educational program p

C_p^i = the number of applicable criteria related to the standard i for the educational program p.

n = number of standard elements corresponding to each standard i.

m = number of criteria related to each standard element j.

S = number of quality standards. Here, $S = 6$

P = number of educational programs under investigation.

As defined by NCAAA, the overall quality rating Q_p^i of the standard i for the educational program p shall be calculated according to Table 1.

Table 1
Quality rating and level of standard for the educational program

Level of standard	Quality rating Q_p^i	Average A_p^i
Distinctive Compliance	5 points	≥ 4.5
Perfect Compliance	4 points	From 3.5 < 4.5
Compliance	3 points	From 2.5 < 3.5
Partial Compliance	2 points	From 1.5 < 2.5
Non-Compliance	1 point	< 1.5

Step 1.3: In this step, the total quality rating of the educational program over whole standards will be calculated by the sum of its quality rating at each standard. Eq. (2) shows this. Based on the NCAAA regulations, no program shall be considered for accreditation unless it has obtained at least a compliance level (3 points) in each of the six standards and in each of the essential criteria.

$$T_p^1 = \sum_{i=1}^{S} Q_p^i \qquad \forall\, p = 1, \ldots, P \tag{2}$$

where,

T_p^1 = total quality rating for the educational program p over whole quality standards using the traditional approach

Phase 1: Identify the quality of each educational program's performance (The Proposed Approach

Step 2: As previously indicated, the purpose of the proposed approach is to improve the accuracy of evaluating the performance of educational programs using NCAAA standards. The table of self-evaluation quality standards will be restructured in this step to achieve this goal. The standard elements will be divided into additional elements and their criteria into sub-criteria. Each standard element's essential criteria will be broken down into its essential sub-criteria. Here, instead of 6, there will be 13 standard elements, and there will be 131 linked criteria instead of 96, as shown in Table A2 in Appendix 1.

Step 2.1: In this step, each educational program will go through the steps outlined in step 1.1 of the conventional approach utilizing the new self-evaluation table structure.

Step 2.2: In this step, the evaluation at the level of the overall standard will take place in two sub-steps. First, evaluation points will be gathered for all sub-criteria associated with each standard element as per the quality level shown in Table 1. This process provides an evaluation based on the standard elements (i.e., decomposed process). Second, the evaluation process at the original quality standard level will be determined using the median of the outcomes from evaluating at the level of standard elements (i.e., recomposed process). Eqs. (3-5) will be employed to get the average quality rating followed by the overall quality rating of each standard.

$$R_p^j = \frac{\sum_{k=1}^{E_j} V_p^{ijk}}{C_p^{ij}} \qquad \forall\, i = 1,\dots,S \quad \forall\, j = 1,\dots,H_i \quad \forall\, p = 1,\dots,P \tag{3}$$

$$Q_p^i = \frac{\sum_{j=1}^{H^i} R_p^j}{H_i} \qquad \forall\, p = 1,\dots,P \tag{4}$$

where,

R_p^j = the average quality rating of the standard element j for the educational program p.

V_p^{ijk} = the evaluation score (1 to 5) of sub-criteria k related to standard element j and standard i for the educational program p

C_p^{ij} = the number of applicable sub-criteria related to the standard element j and standard i for the educational program p.

E_j = the number of sub-criteria corresponding to each standard element j.

H^i = the number of standard elements corresponding to each standard i.

S = the number of quality standards. Here, $S = 6$

P = the number of educational programs under investigation.

Table 1 will be used for both R_p^j and Q_p^i.

Step 2.3: In this step, the total quality rating of the educational program over whole standards will be calculated by the sum of its quality rating at each standard. Eq. (5) shows this.

$$T_p^2 = \sum_{i=1}^{S} Q_p^i \qquad \forall\, p = 1,\dots,P \tag{5}$$

where,

T_p^2 = total quality rating for the educational program p over whole quality standards using the proposed approach

Phase 2: Rank the educational programs (The NCAAA Approach)

Step 1.4: In this step, the educational programs will be ranked in descending order using their total quality ratings obtained from Eq. (2). Each program can get a maximum quality rating of 30 points (number of quality standards: 6 x highest level of each standard: 5). Therefore, if the program's total quality rating is less than 18 points (i.e., less than a Compliance level), it has to receive additional attention to meet the NCAAA requirements.

Phase 2: Rank the educational programs (The Proposed Approach)

Step 2.4: The NCAAA visit team will look through other documents and data in addition to the educational program's self-evaluation scale. The NCAAA identified these documents and data such as the course specification report, program annual report, reports on the advisory committee's performance, self-study report, number of published papers in reputable journals, and total income from research work with industry. Table A3 in Appendix 1 shows the additional sub-criteria related to documents. Therefore, standard elements with corresponding sub-criteria are added to the self-evaluation table as "others" standard elements to account for the percentages of completing these documents. The newly organized table will be more comprehensive than the current one. Instead of 9, there will be 19 standard elements and 146 linked criteria instead of 96. On the other side, the proposed approach will rank the educational programs using the TOPSIS technique as one of the MCDM tools. Therefore, weighting

the sub-criteria associated with quality standards is necessary to determine their relative importance. The hierarchy tree of quality standards, standard elements, main criteria, and sub-criteria is depicted in Figure 2. The most common methods used to determine the criteria weights are AHP and Best-Worst-Method (BWM). Pairwise comparison is the foundation of these two techniques. For the AHP approach, the number of pair comparisons is $n(n-1)/2$; for the BWM, it is $(2n-3)$, where n is the number of weighted criteria. When there are several criteria (i.e., $n>7$), pair comparisons expand, and people get too perplexed to provide proper responses when there are numerous inquiries regarding the same problem (Tuan et al., 2020). It is suggested to use a quantitative approach based on NCAAA rules of the quality standard levels listed in Table 1. The approach is predicated on the idea that the program must achieve a Distinctive level (5 points) in each of the essential sub-criteria and at least a Compliance level (3 points) in the rest. Each sub-criteria will be given a weight according to Eq. (6) to Eq. (8) taking into consideration the visualized tree shown in Figure 2. The overall weight of all the quality standards and all the sub-criteria is 1, respectively.

$$W^i = \frac{5E^{*i} + 3E^i}{5Z^* + 3Z} \qquad i = 1, \dots, S \tag{6}$$

$$w^{*i} = W^i \left(\frac{5}{5Y^{*i} + 3Y^i}\right) \tag{7}$$

$$w^i = W^i \left(\frac{3}{5Y^{*i} + 3Y^i}\right) \tag{8}$$

where,
W^i = weight of the quality standard i.
E^{*i} = the number of the essential criteria related to quality standard i.
E^i = the number of the non-essential criteria related to quality standard i.
Z^* = the number of the essential criteria over the whole quality standards. Here, $Z^* = 22$
Z = the number of the non-rest criteria related to quality standard i. Here, $Z = 89$
w^{*i} = weight of the essential sub-criteria related to quality standard i.
w^i = weight of the non-essential sub-criteria related to quality standard i.
Y^{*i} = the number of the essential sub-criteria related to quality standard i.
Y^i = the number of the non-essential sub-criteria over the whole quality standards.

Step 2.5:   in this step, construct the form of a decision-making matrix X_{ij} as given in Eq. (9).

$$[x_{ij}]_{mxn} = \begin{bmatrix} A/C & C_1 & C_2 & \dots & C_n \\ A_1 & x_{11} & x_{12} & \dots & x_{1n} \\ A_2 & x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ A_m & x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix} \tag{9}$$

where,
$A = [A_1, A_2, \dots, A_m]$ – a given set of educational programs (alternatives), and m is the total number of alternatives.
$C = [C_1, C_2, \dots, C_n]$ – a given set of criteria, and n is the total number of criteria. Some of the criteria should be maximized, while some should be minimized. Here, the sub-criteria of the self-evaluation will be considered as the evaluation criteria of the educational programs.
$[x_{ij}]_{mxn}$ – an assessment of alternative A_i with respect to a set of criteria.

Step 2.6:   The problem data is multidimensional since each criterion is described by its associated dimension. Making choices in this circumstance is challenging. The multidimensional decision space must be transformed into a nondimensional decision space to get around these problems. In this step, determine the normalized decision matrix f_{ij} in the form given in Eq. (10).

$$f_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \qquad i = 1, \dots, m \quad j = 1, \dots, n \tag{10}$$

Step 2.7:   Calculate the weighted normalized decision matrix v_{ij}. The weighted normalized decision matrix can be calculated by multiplying the normalized decision matrix by the weight of the decision criteria obtained from Eq. (7) and Eq. (8) and is expressed as in EQ. (11).

$$v_{ij} = \begin{cases} w^{*i} f_{ij} & \text{For essential criteria} \\ w^i f_{ij} & \text{For non-essential criteria} \end{cases} \tag{11}$$

Step 2.8: Determine the positive-ideal and negative-ideal solutions using Eq. (12) and Eq. (13).

$$Z^+ = \{v_1^+, v_2^+, \dots, v_j^+\} = \{(max\ v_{ij} \mid j \in I), (min\ v_{ij} \mid j \in I')\} \tag{12}$$

$$Z^- = \{v_1^-, v_2^-, \dots, v_j^-\} = \{(min\ v_{ij} \mid j \in I), (max\ v_{ij} \mid j \in I')\} \tag{13}$$

where, I is associated with the benefit criteria and I' is related to the cost criteria.

Step 2.9: Calculate the separation measures. The separation of each alternative from the positive-ideal and negative-ideal solutions are evaluated, respectively, as in Eq. (14) and Eq. (15) respectively.

$$S_i^+ = \left\{ \sum_{j=1}^{n} (v_{ij} - v_j^+)^2 \right\}^{\frac{1}{2}} \qquad i = 1, \dots, m \tag{14}$$

$$S_i^- = \left\{ \sum_{j=1}^{n} (v_{ij} - v_j^-)^2 \right\}^{\frac{1}{2}} \qquad i = 1, \dots, m \tag{15}$$

Step 2.10: Calculation of the relative closeness to the positive ideal solution. The relative closeness p_i of the alternatives to the positive ideal solution is evaluated as in Eq. (16).

$$p_i = \frac{S_i^-}{S_i^+ + S_i^-} \qquad i = 1, \dots, m \quad j = 1, \dots, n \tag{16}$$

Step 2.11: Rank the educational programs (alternatives) in descending order of their relative closeness p_i. The alternative with the maximum p_i value is closer to achieving the NCAAA requirements for accreditation.

Phase 3: Comparative analysis between the NCAAA approach and the proposed approach

Step 3: In this step, two different comparisons between the two approaches are considered. The initial comparison was made based on the total quality rating and standard level for the educational programs that were acquired from each approach. The second is based on comparing the program using non-weighted and weighted decision criteria (the latter being the proposed approach).

4. Application and Results

University in the Middle East region was used to apply the proposed approach illustrated before. The considered educational programs provide undergraduate and graduate-level instruction. The programs primarily deal with the fields of mechanical engineering (A1), industrial engineering (A2), mining engineering (A3), nuclear engineering (A4), agriculture (A5), chemical engineering (A6), law (A7), and civil engineering (A8). All programs strive to receive NCAAA accreditation. Each program has a formal accrediting unit of chosen staff members (often from 3 to 4) who are in charge of studying the accreditation procedures from NCAAA, preparing the necessary documents and data, and conducting the self-evaluation of the program's performance in terms of quality. The department chair that offers the educational program oversees the accreditation unit. The following is an application of the earlier three phases to rank the programs according to the NCAAA's quality standards and weighted criteria.

Phase 1: Identify the quality of each educational program's performance (The NCAAA Approach)

The quality performance of the eight educational programs (alternatives) was self-evaluated using Table A1 in line with steps 1, 1.1, and 1.2. Table 2 presents the outcomes of step 1.2 using Eq. (1) and definitions of standard levels given in Table 1. For step 1.3 and Eq. (2), Table 2 also displays the overall quality ratings for all standards for each program.

Phase 2: Rank the educational programs (The NCAAA Approach)

According to step 1.4, the educational programs are rated in descending order, as shown in Table 2, based on the total quality ratings obtained from step 1.3.

Table 2
Overall quality rating of each standard for each educational program (The NCAAA Approach)

Quality standards/Alternatives		A1	A2	A3	A4	A5	A6	A7	A8
1	Mission and goals	4	3	3	4	4	5	5	4
2	Program management and quality assurance	4	3	3	4	3	4	4	4
3	Teaching and learning	4	4	3	4	4	4	4	4
4	Students	4	3	4	4	4	4	4	3
5	Teaching staff	4	3	4	4	4	4	4	4
6	Learning, Resources, Facilities, and Equipment	4	3	3	4	4	4	4	3
Total quality ratings for all standards		24	19	20	24	23	25	25	22
Alternatives rankings		2	6	5	2	3	1	1	4

Phase 1: Identify the quality of each educational program's performance (The Proposed Approach)

The quality performance of the eight educational programs was self-evaluated using Table A2 in line with steps 2, 2.1, and 2.2. In Table 3, the outcomes of step 2.2 are presented using Eq. (3) and Eq. (4) and definitions of standard levels given in Table 1. For step 2.3 and Eq. (5), Table 3 also displays overall quality ratings for all standards for each program. In the case of using the outcomes from step 2.3 for ranking the programs, Table 3 shows the new rankings.

Table 3
Overall quality ratings of each standard for each educational program (The Proposed Approach)

Quality standards/Alternatives		A1	A2	A3	A4	A5	A6	A7	A8
1	Mission and goals	3	4	3	3	2	3	3	3
2	Program management and quality assurance	3	4	4	3	3	3	3	4
3	Teaching and learning	3	3	3	3	3	3	3	3
4	Students	3	3	3	3	3	3	3	3
5	Teaching staff	3	3	4	3	3	3	2	3
6	Learning, Resources, Facilities, and Equipment	3	3	4	3	3	3	3	3
Total quality rating for all standards		18	20	21	18	17	18	17	19
Alternatives rankings		4	2	1	4	5	4	5	3

Phase 2: Rank the educational programs (The Proposed Approach)

This section applied the TOPSIS method using the data driven by the accreditation unit in each educational program. Table 4 shows the weighted criteria, while Table 5, Table 6, and Table 7 show the input decision matrix, the normalized, and the weighted normalized input data based on steps 2.4, 2.5, 2.6, and 2.7, respectively, and Eq. (6) to Eq. (11). Because there are 146 criteria and the large table sizes needed to display them, the tables in this section only show part of the input data and results. Except for the criteria (C124 and C126) with the codes 5-2-0-1 and 5-2-0-3, respectively, all criteria connected to "others" standard elements (see Table A3) are minimum. The remaining criteria are maximum. By using Eq. (12) and (13), the positive and negative ideal solutions (i.e., Z^+ and Z^-) can be calculated for eight educational programs, as illustrated in Table 7. The rankings of alternative programs are determined using Eq. (14) to Eq. (16). The final rankings with evaluation results are represented in Table 8. The shortest distance to the positive ideal solution and the longest distance to the negative ideal solution is the optimal alternative. The proposed model results show that the (A6) program is the best alternative with a P_i value of 0.59058.

Table 4
Information on the weighted criteria

Criteria	C1	C2	C3	…	C145	C146
Objective	Max.	Max.	Max.	…	Max.	Min.
Weight	0.00638	0.00638	0.00638	…	0.00579	0.00579

Table 5
Input decision-making matrix

Alternative/Criteria	C1 Max.	C2 Max.	C3 Max.	…	C145 Max.	C146 Min.
A1	3	3	4	…	4	30%
A2	4	4	4	…	3	10%
A3	5	5	5	…	3	15%
A4	3	3	3	…	3	35%
A5	3	2	2	…	3	30%
A6	4	4	7	…	3	25%
A7	3	3	3	…	4	25%
A8	4	4	4	…	3	20%

Table 6
Normalize decision-making matrix

Alternative/Criteria	C1 Max.	C2 Max.	C3 Max.	…	C145 Max.	C146 Min.
A1	0.28735	0.29417	0.33333	…	0.43133	0.42426
A2	0.38313	0.39223	0.33333	…	0.32350	0.14142
A3	0.47891	0.49029	0.41667	…	0.32350	0.21213
A4	0.28735	0.29417	0.25000	…	0.32350	0.49497
A5	0.28735	0.19612	0.16667	…	0.32350	0.42426
A6	0.38313	0.39223	0.58333	…	0.32350	0.35355
A7	0.28735	0.29417	0.25000	…	0.43133	0.35355
A8	0.38313	0.39223	0.33333	…	0.32350	0.28284

Table 7
Weighted normalized decision-making matrix

Alternative/Criteria	C1 Max.	C2 Max.	C3 Max.	…	C145 Max.	C146 Min.
A1	0.00183	0.00188	0.00213	…	0.00250	0.00246
A2	0.00244	0.00250	0.00213	…	0.00187	0.00082
A3	0.00305	0.00313	0.00266	…	0.00187	0.00123
A4	0.00183	0.00188	0.00159	…	0.00187	0.00287
A5	0.00183	0.00125	0.00106	…	0.00187	0.00246
A6	0.00244	0.00250	0.00372	…	0.00187	0.00205
A7	0.00183	0.00188	0.00159	…	0.00250	0.00205
A8	0.00244	0.00250	0.00213	…	0.00187	0.00164
Z^+	0.00305	0.00313	0.00372	…	0.00250	0.00082
Z^-	0.00183	0.00125	0.00106	…	0.00187	0.00287

Table 8
The final evaluation and ranking of the educational programs (alternatives)

Alternative	S^+	S^-	P_i	Rank
A1	0.01300	0.01857	0.58830	2
A2	0.01507	0.01874	0.55438	3
A3	0.01626	0.01641	0.50233	4
A4	0.01998	0.01171	0.36959	8
A5	0.01701	0.01466	0.46287	6
A6	0.01342	0.01936	0.59058	1
A7	0.01731	0.01410	0.44880	7
A8	0.01687	0.01601	0.48686	5

Phase 3: Comparative analysis between the NCAAA approach and the proposed approach

The two approaches are compared in two separate ways in this section. Initial comparisons focused on the overall quality score and benchmark level for the educational programs obtained from each strategy (i.e., comparing the results in Tables 2 and 3, respectively). The second is based on contrasting the programs using unweighted and weighted judgment criteria (The NCAAA approach and the proposed approach using the TOPSIS technique, respectively). Table 9 displays how the eight instructional program fare in each of these scenarios.

Table 9
Comparative programs rankings

Alternative	Non-weighted criteria				Weighted criteria	
	NCAAA Approach		Proposed Approach		TOPSIS Approach	
	Value	Rank	Value	Rank	Value	Rank
A1	24	1	18	4	0.58830	2
A2	19	6	20	2	0.55438	3
A3	20	5	21	1	0.50233	4
A4	24	1	18	4	0.36959	8
A5	23	3	17	5	0.46287	6
A6	25	1	18	4	0.59058	1
A7	25	1	17	5	0.44880	7
A8	22	4	19	3	0.48686	5

5. Discussion

This research paper proposes and evaluates an approach to assessing higher education programs using the SES form developed by the NCAAA by breaking down the original 96 quality performance criteria based on six standards divided into 13 elements into 146 sub-criteria and 19 standard elements that based on the same six standards. In addition, this study used the TOPSIS methodology to rank the educational programs in an institution according to their adherence to and compliance with NCAAA quality standards. The results, given in Tables 2 and 3, of the self-evaluation of eight educational programs using both the NCAAA approach and the proposed approach, respectively, generally showed that:

- The NCAAA's self-evaluation approach is more upbeat than the proposed approach. The quality ratings are higher when utilizing the NCAAA approach than when adopting the proposed approach. For example, from the self-evaluation based on mission and goals standard, (A6) and (A7) programs received quality ratings of 5 points (i.e., Distinctive Compliance) from the NCAAA approach and 3 points (i.e., Compliance) from the proposed approach respectively. As another example, (A5) program received a quality rating of 4 points (i.e., Perfect Compliance) from the NCAAA approach and a quality rating of 2 points (i.e., Partial Compliance) from the proposed approach for the same standard. These two examples demonstrate how the proposed approach was more effective at determining the quality ratings and can assist the educational programs in refining their mission and goals ahead of the accrediting team visit.

- Using the NCAAA's self-evaluation approach, (A7) program received quality ratings for all six standards ranging from 5 to 4 points (i.e., Distinctive Compliance and Perfect Compliance, respectively). On the other hand, utilizing the proposed approach across the same six quality standards, the quality ratings of this program ranged from 3 to 2 points (i.e., Compliance and Partial Compliance). This result indicates that the proposed approach found that one of the billers in the educational programs, the teaching staff, was partially compliant. So, more support for the teaching staff of the law program is required based on their standard criteria.
- Over the six quality standards, (A1) program has got fixed quality ratings of 4 points (i.e., Perfect Compliance) using the NCAAA's self-evaluation and fixed quality ratings of 3 points (i.e., compliance) using the proposed self-evaluation approach. These findings demonstrate that while the NCAAA's self-evaluation approach produced fixed outcomes for the six quality standards, the proposed approach was more accurate since it divided the standard criteria into smaller sub-criteria.
- Comparing the two approaches' rankings of the eight educational programs based on their overall quality ratings revealed a significant difference. Using the NCAAA's self-evaluation technique, the law program ranked first among the other seven programs but using the proposed approach, it came in last. In contrast, the mining program was ranked first using the proposed self-evaluation approach while being last overall compared to the other seven programs using the NCAAA's self-evaluation. This observation shows how the NCAAA approach may produce false rankings for programs as it is based on wide criteria instead of specific sub-criteria.
- Figure 2 depicts the results from Table 4 as a radar chart. The chart's shaded area shows that the total quality ratings obtained from the proposed self-evaluation for (A1), (A4), (A5), (A6), (A7), and (A8) programs are, respectively, 25%, 26%, 28%, 32%, and 14% lower than those obtained from the NCAAA's self-evaluations. In contrast, the proposed self-evaluation results are 5% higher overall quality ratings for each of (A3) and (A2) program than the NCAAA's self-evaluation. These findings show that the proposed approach need not produce values that are inferior to those of the NCAAA approach. The proposed method's primary goal is to improve measurement accuracy.
- The eight educational programs were ranked using the TOPSIS technique based on weighted criteria. Table 9 demonstrated how the TOPSIS rankings differed from those obtained from the NCAAA and proposed approaches based on non-weighted criteria, except that the chemical (A6) program had received the first in both situations. Of course, the TOPSIS technique provides a more accurate ranking because it gauges how close a solution is to the ideal one.
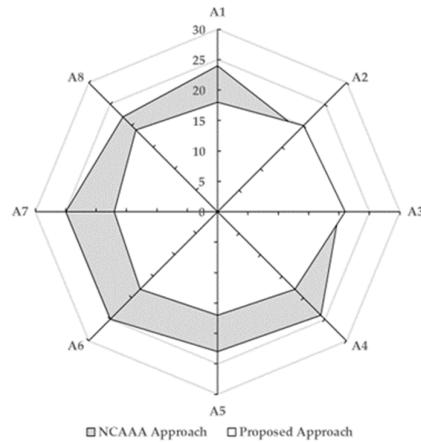
Fig. 2. Comparison of the total quality ratings for the eight educational programs (The NCAAA approach vs. the Proposed Approach)

The findings discussed above show how different assessment strategies for the same educational quality requirements might differ. The results were more accurate since the suggested method relied on in-depth information by breaking down the standard criteria into sub-criteria.   To the best of our knowledge, this is a novel study to propose a more detailed approach and compare it with the traditional NCAAA approach. In addition, it involved eight academic programs that provided a more precise estimate of findings. Moreover, user-friendly computer software based on MS Excel was created to help educational programs' evaluators execute the self-evaluation using the proposed approach and to calculate the criteria weights directly. This will automate the suggested standard level of the educational program and simplify the calculations needed to obtain each standard's overall quality rating and the six standards' total quality rating. Additionally, since the software can identify user errors in the section evaluating educational programs based on standards' criteria, any human entry error made during the self-five evaluation scale will be zero.

6. Conclusions

Ensuring minimum quality in university educational programs is a must. In a dynamic environment under which HEIs function, they must engage in an ongoing improvement process to successfully navigate the quality challenges of the educational process. Therefore, the ETEC and NCAAA imposed QA standards to guarantee a minimum quality level of educational programs. Despite basing evaluations on those standards in universities, evaluating academic programs depends on the evaluators' experiences and could vary between the evaluators for the same program or different programs. Therefore, more precise evaluation approaches should be developed to ensure the true reflection of quality.

This research paper proposes and evaluates an approach to assessing higher educational programs using the SES developed by the NCAAA. The proposed approach breaks down the original performance criteria (96 quality performance criteria based on six standards) into sub-criteria and elements (146 sub-criteria and 19 elements) to ensure the required data quality. Furthermore, a comparative study is conducted to compare the NCAAA's original performance criteria and the proposed evaluation sub-criteria. A three-phase comparison framework that includes the use of TOPSIS is developed. Data from eight programs offered in a Middle Eastern University was used for the application and comparison between the two evaluation approaches. Results show that both approaches provide different quality performance rankings. Also, the proposed approach demonstrated more conservative and accurate overall quality performance ratings, indicating that the application decision for accreditation is affected.

To the best of our knowledge, the proposed self-evaluation approach is novel as it is based on more detailed criteria that increase the evaluation's accuracy and reduce the variation among evaluators. The proposed evaluation approach could be applied to other programs and universities. Furthermore, the comparison framework developed in this study could be used for other academic accreditation systems than the NCAAA, including MCDM techniques other than the TOPSIS. Furthermore, the proposed approach in this study and the comparative framework forms a potential basis for automating the evaluation process and its calculations. This is through developing user-friendly computer software to reduce data entry errors, reduce time and exerted effort, and standardize the format of evaluation outcomes.

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Appendix A:

Table A1

The NCAAA self-evaluation table for high educational programs

Quality Standard			Level of Evaluation				
1	Mission and Goals		Not Satisfactory		Satisfactory		
Standard Elements/Criteria		NA	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
1-0	-		1	2	3	4	5
1-0-1	**The program has a clear, appropriate, approved and publicized widely mission that is consistent with the mission of the institution and the college/department; and is consistent with the needs of the society and the national trends***						
1-0-2	The program goals are linked to its mission, consistent with the goals of the institution/college, and characterized by being clear, realistic, and measurable						
1-0-3	The program mission and goals guide all its operations and activities (e.g., planning, decision-making, resources allocation, curriculum development)						
1-0-4	The program goals and its implementation needs are linked to appropriate operational plans that are consistent with the institution/college plans						
1-0-5	Program managers monitor the extent to which its goals are achieved, through specific performance indicators, and take the necessary actions for performance improvement*						
1-0-6	The program mission and goals are reviewed periodically and developed accordingly with the participation of relevant stakeholders						
Quality Standard			Level of Evaluation				
2	Program management and quality assurance		Not Satisfactory		Satisfactory		
Standard Elements/Criteria		NA	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
2-1	Program Management		1	2	3	4	5
2-1-1	The program is governed by specialized councils (College Council, Department Council) with defined tasks and authorities.						
2-1-2	The program leadership has the appropriate academic and administrative experience to achieve its mission and goals						
2-1-3	**The program has the sufficient number of qualified Staff to perform its administrative, professional, and technical tasks, and they have defined tasks and authorities***						
2-1-4	The program management acts to provide an organizational climate and supportive academic environment						
2-1-5	There are appropriate mechanisms for integration and effective participation among branches offering the same program						
2-1-6	The program is committed to applying the institutional regulations governing the educational and research partnerships (if any) in order to ensure the quality of all aspects of the program, including courses, educational resources, teaching, student achievement standards, and offered services						
2-1-7	The program assesses the effectiveness of its educational and research partnerships (if any) on a regular basis and makes appropriate decisions accordingly						
2-1-8	The program management monitors its commitment to implement its role in the community partnership plan of the institution through specific performance indicators						
2-1-9	The program management monitors its commitment to implement its role in the research plan of the institution through specific performance indicators						
2-1-10	There is a sufficient amount of flexibility and authorities that allows program leadership to bring about the necessary development and changes, in response to the recent events and to the results of periodic evaluation of the program and its courses						
2-1-11	The program management applies mechanisms ensuring integrity, fairness, and equality in all its academic and administrative practices, and between the male and female student sections and branches (if any).						
2-1-12	**The program forms an advisory committee, comprised of members of professionals and experts in the program specialization, to contribute to its evaluation, development, and performance improvement***						
2-1-13	The program management is committed to developing and improving professional skills and capabilities of the supportive technical and administrative Staff to keep up with modern developments						
2-1-14	The program management provides reliable and publicly disclosed information to the community about the program description, performance, and achievements that suits the needs of the stakeholders						
2-1-15	The program management encourages the developmental initiatives and proposals						
2-1-16	**The program implements an effective system to evaluate the performance of leaders, teaching Staff, and employee according to clear, published standards and mechanisms that ensure fairness, transparency, and accountability; and the results of the evaluation are used to provide feedback, improvement, and development***						
2-1-17	**The program management is committed to activating the values of the scientific integrity, intellectual property rights, rules of ethical practices, and proper conduct in all academic, research, administrative, and service fields and activities***						
2-1-18	The program management applies the systems, regulations, and procedures that are approved by the institution/college, including those related to grievance, complaints, and disciplinary cases						
2-1-19	The program has adequate financial funding to achieve its mission and goals, along with existence of mechanisms for prioritizing expenditures.						
2-2	Program Quality Assurance						

		NA	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
2-2-1	The program management implements an effective quality assurance and management system that is consistent with the institution quality system						
2-2-2	The teaching staff, employee, and students participate in planning, quality assurance, and decision-making processes						
2-2-3	The program management approves key performance indicators that accurately measure the program performance and coordinates to provide regular data on them						
2-2-4	**The program analyzes the evaluation data annually (e.g., performance indicators and benchmarking data, student progress, program completion rates, student evaluations of the program, courses and services, views of graduates and employers); and results are used in planning, development, and decision-making processes***						
2-2-5	The program conducts a periodic, comprehensive evaluation (every three / five years) and prepares reports about the overall level of quality, with the identification on points of strength and weakness; plans for improvement; and follows up its implementation						

Quality Standard				Level of Evaluation			
3	Teaching and Learning			Not Satisfactory		Satisfactory	
Standard Elements/Criteria		NA	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
3-1	Graduate Attributes and Learning Outcomes		1	2	3	4	5
3-1-1	The program identifies its graduate attributes and intended learning outcomes that are consistent with its mission, and aligned with the graduate attributes at the institutional level; and they are approved, publicly disclosed, and periodically reviewed						
3-1-2	**The graduate attributes and learning outcomes are consistent with the requirements of the National Qualifications Framework (NQF) and with academic, professional, and labor market requirements***						
3-1-3	The program identifies the learning outcomes for the different tracks (if any)						
3-1-4	**The program applies appropriate mechanisms and tools for measuring the graduate attributes and learning outcomes, and verifying their achievement according to specific performance levels and assessment plans***						
3-2	Curriculum						
3-2-1	The program is committed to the institutional policies, standards, and procedures in the design, development, and modification of the curriculum						
3-2-2	**The curriculum design considers fulfilling the program goals and learning outcomes, and the educational, scientific, technical, and professional developments in the field of specialization; and is periodically reviewed***						
3-2-3	**The study plan ensures the balance between the general and specialty requirements, and between theoretical and applied aspects; and it takes into account the sequencing and integration of the courses***						
3-2-4	The construction of the program study plan considers the identification of exit-points requirements (if any)						
3-2-5	The program study plan considers the adequate requirements for the different tracks (if any) in accordance with international practices and similar programs						
3-2-6	The curriculum includes integrated curricular and extracurricular activities that contribute to the achievement of the program learning outcomes						
3-2-7	**The learning outcomes in the courses are aligned with the program learning outcomes (e.g., Matrix for the alignment of the learning outcomes of the courses with program learning outcomes)***						
3-2-8	Teaching and learning strategies and assessment methods are aligned with the intended learning outcomes at the program and course levels						
3-2-9	Teaching and learning strategies are student-centered and encourage active learning						
3-2-10	Teaching and learning strategies and assessment methods in the program vary according to its nature and level, enhance the ability to conduct research, and ensure students' acquisition of higher cognitive thinking and self-learning skills						
3-2-11	The learning outcomes of the field experience activities are aligned with the learning outcomes of the program; and appropriate strategies for training, assessment, and training venues are identified in order to achieve these outcomes						
3-2-12	Both the program field-experience supervisor and the field supervisor are informed with the intended learning outcomes and the nature of the tasks entrusted to each of them (supervision, follow-up, student assessment, evaluation and development of field experience); and their commitment is followed up according to specific mechanisms						
3-2-13	**The program ensures a unified application of its study plan as well as the program and the course specifications offered at more than one site (sections of male and female students and different branches)***						
3-3	Quality of Teaching and Student's Assessment						
3-3-1	**The program monitors the commitment of the teaching staff to the learning and teaching strategies and assessment methods included in the program and course specifications through specific mechanisms***						
3-3-2	The necessary training is provided for the teaching staff on learning and teaching strategies and assessment methods identified in the program and course specifications, along with the effective use of modern and advanced technology; and their use is monitored						
3-3-3	At the beginning of each course, students are provided with comprehensive information about the course, including learning outcomes, teaching, and learning strategies, and assessment methods and dates, as well as what is expected from them during the study of the course						
3-3-4	The courses are periodically evaluated for ensuring the effectiveness of the teaching and learning strategies and assessment methods, and reports are prepared on them						
3-3-5	The program applies mechanisms to support and motivate excellence in teaching, and encourages creativity and innovation of the teaching staff						
3-3-6	The program implements clear and publicized procedures to verify the quality and validity of the assessment methods (e.g., their specifications, diversity, and comprehensiveness to cover the learning outcomes, distribution of grades and accuracy of marking), and to ensure the level of student achievement						
3-3-7	Effective procedures are used to verify that the work and assignments of students are of their own						
3-3-8	The feedback is provided to students about their performance and evaluation results at a time that allows them to improve their performance						

Quality Standard				Level of Evaluation			
4	Students		NA	Not Satisfactory		Satisfactory	

Standard Elements/Criteria		Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
4-0	-	1	2	3	4	5
4-0-1	The program has approved and publicly disclosed criteria and requirements for the admission and registration of students that are appropriate to the nature of the program, and are applied fairly					
4-0-2	The number of students admitted to the program is compatible with the available resources for the program (e.g., teaching Staff, classrooms, labs, and equipment)					
4-0-3	The program provides basic information to students, such as study requirements, services, and financial fees (if any), through various means					
4-0-4	The program applies fair and approved policies and procedures for students transferring to the program and the equivalency of what students had previously learned					
4-0-5	The program provides comprehensive orientation for new students, ensuring their full understanding of the types of services and facilities available to them					
4-0-6	**The program informs students about their rights and duties, the code of conduct, and grievance, complaints, and discipline procedures, using a variety of means; and applies them fairly***					
4-0-7	**Students are provided with effective academic, professional, psychological, and social guidance, and counseling services through qualified and sufficient Staff***					
4-0-8	Mechanisms are applied to identify gifted, creative, talented, and underachieving students in the program, and appropriate programs are available to care for, motivate, and support each group of them					
4-0-9	Students in the program are offered extracurricular activities in variety of fields to develop their abilities and skills, and the program takes appropriate actions to support and motivate their participation					
4-0-10	The students and alumni of the program are provided with additional activities for their professional development, consistent with the intended learning outcomes, and labor market developments					
4-0-11	The program implements effective procedures to monitor students' progress and to verify their fulfilment of graduation requirements					
4-0-12	The program implements an effective mechanism to communicate with its alumni and involve them in its events and activities, explore their views, and benefit from their expertise and support; and provides updated and comprehensive databases about them					
4-0-13	**Effective mechanisms are applied to evaluate the adequacy and quality of services provided to students and measure their satisfaction with them; and the results are used for improvement***					
4-0-14	The program takes into consideration the special needs of its students (e.g., students with disabilities and international students)					
4-0-15	The program implements effective mechanisms to ensure the regularity of students' attendance and their active participation in the course and field experience activities					
4-0-16	There is an appropriate representation for students in relevant councils and committees					

Quality Standard			Level of Evaluation			
5	Teaching Staff		Not Satisfactory		Satisfactory	
Standard Elements/Criteria		NA	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
5-0	-		1	2	3	4	5
5-0-1	The program applies appropriate recruitment policies and procedures to attract faculty members, and retains the distinguished ones						
5-0-2	**The program has an adequate number of faculty members at all sites where it is offered (e.g., male and female student sections, branches)***						
5-0-3	**The faculty members have the necessary competency (e.g., qualifications, certificates, professional licenses, experience required), and effective teaching skills; and appropriate mechanisms are applied for verification***						
5-0-4	The program provides appropriate orientation for new and adjunct teaching staff to ensure their understanding of the nature of the program, their rights, tasks, responsibilities, and workload						
5-0-5	The teaching and adjunct staff in the professional programs include some experienced and highly skilled professionals in the field of the program						
5-0-6	The teaching staff regularly participate in academic activities (e.g., participation in conferences and group discussions, research projects, arbitration of theses and research) to ensure their awareness of the latest developments in their fields of specialization; and their participation in these activities and scientific production are considered in their criteria for evaluation and promotion						
5-0-7	Faculty members effectively participate in research activities and scientific production; and their participation in these activities is considered as one of the criteria for their evaluation and promotion						
5-0-8	Teaching staff participate in community partnership activities; and their participation in these activities is considered as one of the criteria for their evaluation and promotion						
5-0-9	Teaching staff participate in professional and academic development programs in accordance with a plan that meets their needs and contributes to the development of their performance						
5-0-10	Teaching staff participate in assessment and development activities of the program and institution						
5-0-11	Effective mechanisms are applied to evaluate the adequacy and quality of the services provided to the teaching staff and to measure their satisfaction with them						
5-0-12	The performance of the teaching staff is regularly assessed according to specific and published criteria; feedback is provided to them; and the results are used in improving the performance						

Quality Standard			Level of Evaluation		
6	Learning, Resources, Facilities, and Equipment	NA	Not Satisfactory		Satisfactory

Standard Elements/Criteria		Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
6-0	-	1	2	3	4	5
6-0-1	The program implements clear policies and procedures that ensure the adequacy and appropriateness of learning resources and services provided to support student learning					
6-0-2	The program implements effective procedures for the management of resources and reference materials needed to support teaching and learning processes					
6-0-3	**The library has a sufficient number of various resources that are easily accessible and appropriate to the needs of the program and the number of students; are made available in adequate and appropriate times for male and female student sections; and are updated periodically***					
6-0-4	The program has specialized electronic resources (e.g., digital references, multimedia, software), and appropriate databases and electronic systems that allow beneficiaries to access the information, research materials, and scientific journals from within or outside the institution					
6-0-5	**The program has laboratories, computer and technology equipment, and materials that are suitable to the specialty and sufficient to conduct research and scientific studies according to the program goals; and applies appropriate mechanisms to maintain and update them***					
6-0-6	The teaching staff, students, and employee of the program have the appropriate orientation and technical training and support for the effective use of resources and means of learning					
6-0-7	The program has the suitable classrooms and facilities for its needs					
6-0-8	**All health, and general and professional safety requirements are available in the facilities, equipment, and the educational and research activities***					
6-0-9	Standards for safety, environmental conservation, and hazardous waste disposal are applied efficiently and effectively					
6-0-10	The program has the sufficient number of qualified technicians and specialists for the operation and preparation of laboratories					
6-0-10	The program has facilities, equipment, and services suitable for those students, teaching staff, and employee with disabilities					
6-0-11	The program has the appropriate technologies, services, and environment for courses offered through distance or e-learning according to their own specific standards					
6-0-12	The program evaluates the effectiveness and efficiency of learning resources, facilities, and equipment of all types; and the results are used for improvement					

Number of quality standards = 6   Number of standard elements = 5   Number of essential criteria = 22
Number of criteria = 96

Table A2
The proposed self-evaluation table for high educational programs

Quality Standard			Level of Evaluation				
1		Mission and Goals	Not Satisfactory		Not Satisfactory		
		Proposed Standard Elements NA Criteria Code/Proposed Sub-Criteria	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
1-1		Mission	1	2	3	4	5
1-0-1	C1	**The program has a clear, appropriate, approved and publicized widely mission***					
	C2	**The program mission is consistent with the mission of the institution and the college/department***					
	C3	**The program mission is consistent with the needs of the society and the national trends***					
1-2		Goals					
1-0-2	C4	The program goals are linked to its mission					
	C5	The program goals consistent with the goals of the institution/college					
	C6	The program goals are clear, realistic, and measurable					
1-0-4	C7	The program goals and its implementation needs are linked to appropriate operational plans					
	C8	The program goals are consistent with the institution/college plans					
1-0-5	C9	**Program managers monitor the extent to which its goals are achieved, through specific performance indicators***					
	C10	**Program managers take the necessary actions for performance improvement of its goals***					
1-3		Mission and Goals					
1-0-3	C11	The program mission and goals guide all its operations (e.g., planning, decision-making, resources allocation, …)					
	C12	The program mission and goals guide all its activities (e.g., resource allocation, curriculum development, …)					
1-0-6	C13	The program mission and goals are reviewed periodically and developed accordingly with the participation of relevant stakeholders					
Quality Standard			Level of Evaluation				
2		Program management and quality assurance	Not Satisfactory		Not Satisfactory		
		Proposed Standard Elements NA Criteria Code/Proposed Sub-Criteria	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
2-1		Program Management	1	2	3	4	5
2-1-1	C15	The program is governed by specialized councils (College Council, Department Council) with defined tasks and authorities.					
2-1-2	C16	The program leadership has the appropriate academic and administrative experience to achieve its mission and goals.					

			NA	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
2-1-3	C17	**The program has the sufficient number of qualified Staff to perform its administrative, professional, and technical tasks***						
	C18	**The program has the sufficient number of qualified Staff who have defined tasks and authorities***						
2-1-4	C19	The program management acts to provide an organizational climate and supportive academic environment						
2-1-5	C20	There are appropriate mechanisms for integration and effective participation among branches offering the same program.						
2-1-6	C21	The program is committed to applying the institutional regulations governing the educational and research partnerships (if any)						
2-1-7	C22	The program assesses the effectiveness of its educational and research partnerships (if any) on a regular basis						
	C23	The program makes appropriate decisions accordingly based on its assessment and effectiveness						
2-1-8	C24	The program management monitors its commitment to implement its role in the community partnership plan of the institution						
2-1-9	C25	The program management monitors its commitment to implement its role in the research plan of the institution						
2-1-10	C26	There is a sufficient amount of flexibility and authorities that allows program leadership to bring about the necessary development and changes						
2-1-11	C27	The program management applies mechanisms ensuring integrity, fairness, and equality in all its academic and administrative practices						
2-1-12	C28	**The program forms an advisory committee, comprised of members of professionals and experts in the program specialization***						
2-1-13	C29	The program management is committed to developing and improving professional skills of the supportive technical and administrative Staff						
2-1-14	C30	The program management provides reliable and publicly disclosed information to the community about the program						
2-1-15	C31	The program management encourages the developmental initiatives and proposals						
2-1-16	C32	**The program implements an effective system to evaluate the performance of leaders, teaching Staff, and employee***						
2-1-17	C33	**The program management is committed to activating the values of the scientific integrity, intellectual property rights, rules of ethical practices, and proper conduct***						
2-1-18	C34	The program management applies the systems, regulations, and procedures that are approved by the institution/college						
2-1-19	C35	The program has adequate financial funding to achieve its mission and goals						
2-2		Quality Assurance						
2-2-1	C36	The program management implements an effective quality assurance and management system that is consistent with the institution quality system						
2-2-2	C37	The teaching staff participate in planning, quality assurance, and decision-making processes						
	C38	The employee participates in planning, quality assurance, and decision-making processes						
	C39	The students participate in planning, quality assurance, and decision-making processes						
2-2-3	C40	The program management approves key performance indicators that accurately measure the program performance						
2-2-4	C41	**The program analyzes the evaluation data annually and results are used in planning, development, and decision-making processes***						
2-2-5	C42	The program conducts a periodic, comprehensive evaluation (every three / five years) and prepares reports about the overall level of quality						

	Quality Standard			Level of Evaluation				
3	Teaching and Learning			Not Satisfactory		Not Satisfactory		
	Proposed Standard Elements Criteria Code/Proposed Sub-Criteria		NA	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
3-1		Graduate Attributes and Learning Outcomes		1	2	3	4	5
3-1-1	C44	The program identifies its graduate attributes and intended learning outcomes that are consistent with its mission						
	C45	The graduate attributes are approved, publicly disclosed, and periodically reviewed						
3-1-2	C46	**The graduate attributes and learning outcomes are consistent with the requirements of the National Qualifications Framework (NQF)***						
	C47	**The graduate attributes and learning outcomes are consistent with academic, professional, and labor market requirements***						
3-1-3	C48	The program identifies the learning outcomes for the different tracks (if any).						
3-1-4	C49	**The program applies appropriate mechanisms and tools for measuring the graduate attributes and learning outcomes***						
	C50	**The graduate attributes and learning outcomes are verifying their achievement according to specific performance levels and assessment plans***						
3-2		Curriculum						
3-2-1	C51	The program is committed to the institutional policies, standards, and procedures in the design, development and modification of the curriculum						
3-2-2	C52	**The curriculum design considers fulfilling the program goals and learning outcomes**						
	C53	**The curriculum design considers the educational, scientific, technical and professional developments in the field of specialization**						
	C54	**The curriculum design is periodically reviewed**						
3-2-3	C55	**The study plan ensures the balance between the general and specialty requirements**						
	C56	**The study plan ensures the balance between theoretical and applied aspects**						
	C57	**The study plan takes into account the sequencing and integration of the courses**						
3-2-4	C58	The construction of the program study plan considers the identification of exit-points requirements (if any)						
3-2-5	C59	The program study plan considers the adequate requirements for the different tracks (if any) in accordance with international practices and similar programs						
3-2-6	C60	The curriculum includes integrated curricular and extracurricular activities that contribute to the achievement of the program learning outcomes						
3-2-7	C61	**The learning outcomes in the courses are aligned with the program learning outcomes***						
3-2-8	C62	Teaching and learning strategies and assessment methods are aligned with the intended learning outcomes at the program and course levels						
3-2-9	C63	Teaching and learning strategies are student-centered and encourage active learning						
3-2-10	C64	Teaching and learning strategies and assessment methods in the program vary according to its nature and level						
	C65	Teaching and learning strategies enhance the ability to conduct research						
	C66	Teaching and learning strategies ensure students' acquisition of higher cognitive thinking and self-learning skills						
3-2-11	C67	The learning outcomes of the field experience activities are aligned with the learning outcomes of the program						
	C68	Appropriate strategies for training, assessment, and training venues are identified in order to achieve learning outcomes						
3-2-12	C69	Both the program field-experience supervisor and the field supervisor are informed with the intended learning outcomes and the nature of the tasks entrusted to each of them						
	C70	Both the program field-experience supervisor and the field supervisor commitment is followed up according to specific mechanisms						
3-2-13	C71	**The program ensures a unified application of its study plan as well as the program and the course specifications offered at more than one site***						

3-3		Quality of Teaching and Student's Assessment						
3-3-1	C72	The program monitors the commitment of the teaching staff to the learning and teaching strategies*						
	C73	The program monitors the commitment of the teaching staff to the assessment methods included in the program and course specifications through specific mechanisms*						
3-3-2	C74	The necessary training is provided for the teaching staff on learning and teaching strategies						
	C75	The necessary training is provided for the teaching staff on assessment methods identified in the program and course specifications						
	C76	The teaching staff use of modern and advanced technology effectively						
3-3-3	C77	At the beginning of each course, students are provided with comprehensive information about the course (learning outcomes, assessment methods, ..)						
3-3-4	C78	The courses are periodically evaluated for ensuring the effectiveness of the teaching and learning strategies and assessment methods, and reports are prepared on them						
3-3-5	C79	The program applies mechanisms to support and motivate excellence in teaching, and encourages creativity and innovation of the teaching staff						
3-2-6	C80	The program implements clear and publicized procedures to verify the quality and validity of the assessment methods						
	C81	The program ensures the level of student achievement						
3-2-7	C82	Effective procedures are used to verify that the work and assignments of students are of their own						
3-2-8	C83	The feedback is provided to students about their performance and evaluation results at a time that allows them to improve their performance						

		Quality Standard		Level of Evaluation				
4		Students		Not Satisfactory			Not Satisfactory	
		Proposed Standard Elements Criteria Code/Proposed Sub-Criteria	NA	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
4-1		Students Satisfaction		1	2	3	4	5
4-0-1	C90	The program has approved and publicly disclosed criteria and requirements for the admission and registration of students						
4-0-2	C91	The number of students admitted to the program is compatible with the available resources for the program						
4-0-3	C92	The program provides basic information to students, such as study requirements, services, and financial fees (if any), through various means						
4-0-4	C93	The program applies fair and approved policies and procedures for students transferring to the program and the equivalency of what students had previously learned						
4-0-5	C94	The program provides comprehensive orientation for new students, ensuring their full understanding of the types of services and facilities available to them						
4-0-6	C95	The program informs students about their rights and duties, the code of conduct, and grievance, complaints, and discipline procedures, using a variety of means; and applies them fairly*						
4-0-7	C96	Students are provided with effective academic, professional, psychological, and social guidance, and counseling services through qualified and sufficient Staff*						
4-0-8	C97	Mechanisms are applied to identify gifted, creative, talented, and underachieving students in the program						
	C98	Appropriate programs are available to care for, motivate, and support each group of them						
4-0-9	C99	Students in the program are offered extracurricular activities in variety of fields to develop their abilities and skills						
	C100	The program takes appropriate actions to support and motivate their participation						
4-0-10	C101	The students and alumni of the program are provided with additional activities for their professional development, consistent with the intended learning outcomes, and labor market developments						
4-0-11	C102	The program implements effective procedures to monitor students' progress and to verify their fulfilment of graduation requirements						
4-0-12	C103	The program implements an effective mechanism to communicate with its alumni						
4-0-13	C104	Effective mechanisms are applied to evaluate the adequacy and quality of services provided to students*						
	C105	Effective mechanisms of services measure their satisfaction with students; and the results are used for improvement*						
4-0-14	C106	The program takes into consideration the special needs of its students (e.g., students with disabilities and international students)						
4-0-15	C107	The program implements effective mechanisms to ensure the regularity of students' attendance						
4-0-16	C108	There is an appropriate representation for students in relevant councils and committees						

		Quality Standard		Level of Evaluation				
5		Teaching Staff		Not Satisfactory			Not Satisfactory	
		Proposed Standard Elements Criteria Code/Proposed Sub-Criteria	NA	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
5-1		Teaching		1	2	3	4	5
5-0-1	C110	The program applies appropriate recruitment policies and procedures to attract faculty members, and retains the distinguished ones						
5-0-2	C111	The program has an adequate number of faculty members at all sites where it is offered (e.g., male and female student sections, branches)*						
5-0-3	C112	The faculty members have the necessary competency (e.g., qualifications, certificates, professional licenses, experience required)*						
	C113	The faculty members have effective teaching skills; and appropriate mechanisms are applied for verification*						
5-0-4	C114	The program provides appropriate orientation for new and adjunct teaching staff to ensure their understanding of the nature of the program, their rights, …						
5-0-5	C115	The teaching and adjunct staff in the professional programs include some experienced and highly skilled professionals in the field of the program						
5-0-6	C116	The teaching staff regularly participate in academic activities (e.g., participation in conferences and group discussions , research projects, …						
5-0-7	C117	Faculty members effectively participate in research activities and scientific production; and their participation in these activities is considered as one of the criteria for their evaluation and promotion						
5-0-8	C118	Teaching staff participate in community partnership activities; and their participation in these activities is considered as one of the criteria for their evaluation and promotion						
5-0-9	C119	Teaching staff participate in professional and academic development programs in accordance with a plan that meets their needs						
5-0-10	C120	Teaching staff participate in assessment and development activities of the program and institution						

5-0-11	C121	Effective mechanisms are applied to evaluate the adequacy and quality of the services provided to the teaching staff and to measure their satisfaction with them						
5-0-12	C122	The performance of the teaching staff is regularly assessed according to specific and published criteria; feedback is provided to them						
	C123	The results of performance of the teaching staff are used in improving them						

		Quality Standard		Level of Evaluation				
6		Learning, Resources, Facilities, and Equipment		Not Satisfactory		Not Satisfactory		
		Proposed Standard Elements	NA	Non-Compliance	Partial Compliance	Compliance	Perfect Compliance	Distinctive Compliance
		Criteria Code/Proposed Sub-Criteria						
5-1		Teaching		1	2	3	4	5
6-0-1	C129	The program implements clear policies and procedures that ensure the adequacy and appropriateness of learning resources and services provided to support student learning						
6-0-2	C130	The program implements effective procedures for the management of resources and reference materials needed to support teaching and learning processes						
6-0-3	C131	**The library has a sufficient number of various resources that are easily accessible and appropriate to the needs of the program and the number of students***						
	C132	**The library is made available in adequate and appropriate times for male and female student sections***						
	C133	**The library is updated periodically***						
6-0-4	C134	The program has specialized electronic resources (e.g., digital references, multimedia, software)						
	C135	The program has appropriate databases and electronic systems that allow beneficiaries to access the information, research materials, … from within or outside the institution						
6-0-5	C136	**The program has laboratories, computer and technology equipment, and materials that are suitable to the specialty and sufficient to conduct research and scientific studies***						
	C137	**The program applies appropriate mechanisms to maintain and update its labor, and material stories, computer and technology equipment***						
6-0-6	C138	The teaching staff, students, and employee of the program have the appropriate orientation and technical training and support for the effective use of resources and means of learning						
6-0-7	C139	The program has the suitable classrooms and facilities for its needs						
6-0-8	C140	**All health, and general and professional safety requirements are available in the facilities, equipment, and the educational and research activities***						
6-0-9	C141	Standards for safety, environmental conservation, and hazardous waste disposal are applied efficiently and effectively						
6-0-10	C142	The program has the sufficient number of qualified technicians and specialists for the operation and preparation of laboratories						
6-0-11	C143	The program has facilities, equipment, and services suitable for those students, teaching staff, and employee with disabilities						
6-0-12	C144	The program has the appropriate technologies, services, and environment for courses offered through distance or e-learning according to their own specific standards						
6-0-13	C145	The program evaluates the effectiveness and efficiency of learning resources, facilities, and equipment of all types; and the results are used for improvement						
	Number of essential sub-criteria = 38		Number of standard elements = 13			Number of quality standards = 6		
			Number of sub-criteria = 131					

Table A3

Additional sub-criteria related to NCAAA team visit requirements

Standard Code	Additional Proposed Standard Elements		Proposed Additional Performance Sub-Criteria	
	Code	Title	Code	Title
1	1-4	Others	C14	Percentage of incomplete the documents of Mission and Goals based on the program accreditation eligibility requirements
2	2-3	Others	C43	percentage of incomplete the program's quality assurance system and its performance reports based on the program accreditation eligibility requirements
3	3-4	Others	C84	Percentage of incomplete course specifications report (T4) based on NCAAA templates
			C85	Percentage of incomplete Field Experience Course Specifications report (T5) based on NCAAA templates
			C86	Percentage of incomplete Program Annual Report (T6) based on NCAAA templates
			C87	Percentage of incomplete course reports (T7) out of all offered courses
			C88	Percentage of incomplete Field Experience Course report (T8) based on NCAAA templates
			C89	Percentage of incomplete Program Learning Outcomes reports
4	4-2	Others	C109	Percentage of incomplete report on the number of graduated cohorts and the number of students in each cohort
5	5-2	Others	C124	Percentage of published ISI-Q1 papers out of all published papers per program (average 2 years)
			C125	Percentage of published ISI (not Q1) papers out of all published papers per program (average 2 years)
			C126	Total income from research work with industry (in Saudi Riyal)
			C127	Percentage of incomplete reports on the Advisory Committee's performance and outcomes
			C128	Percentage of incomplete report on program's key performance indicators' measurement and benchmarking for the last three years
6	6-4	Others	C146	Percentage of incomplete Self-Study report (T12) based on NCAAA template
Number of quality standards = 6		Number of additional standard elements = 6		Number of additional sub-criteria = 15